

Attachment 4

Project Description

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Groundwater Recharge Mapping and Water Quality Protection Program Western Placer County, California

Background

Authorities in Placer County, CA have long understood the importance of environmental stewardship. Years of coordinated effort culminated in the establishment of the Western Placer County (WPC) Groundwater Management Plan (WPCGWMP) in 2007. The multi-agency partnership is committed to protect, preserve, and enhance the health and long-term sustainability of the regions groundwater supplies. The WPCGWMP was prepared and adopted by the Cities of Roseville and Lincoln, Placer County Water Agency, and California American Water (together referred to as WPC Partners) in consultation with the California Department of Water Resources. The County of Placer has consulted on the WPCGWMP, but it is not a formal participant.

As adopted, the WPCGWMP established a process to identify and implement a range of collaborative groundwater management actions for a 192.5 square mile area in WPC. The overarching goal of the WPCGWMP is to maintain the quality and ensure the long-term availability of groundwater to meet backup, emergency, and peak demands without adversely affecting other groundwater uses within the WPCGWMP area. **Figure 1** shows the location of the WPCGWMP management area.

To meet the goal of the WPCGWMP, the WPC Partners adopted five Basin Management Objectives (BMOs) and five Component Categories. At the heart of the WPCGWMP is Component Category 2, which establishes a goal that a monitoring program be developed, “capable of assessing the current status of the basin and predicting responses in the basin as a result of future management considerations.” The 2007 WPCGWMP identified that much of the WPC area did not have wells suitable to track groundwater levels and water quality for managing the resource. In recognition of that fact, the WPC Partners applied for AB303 grant funding through the Local Groundwater Assistance Program. In May 2008, the California Department of Water Resources awarded the WPC Groundwater Management Plan Partners (WPC Partners, led by the City of Roseville) a \$250,000 grant to install new groundwater monitoring wells in the WPC area to:

- Supply information to improve the understanding of the entire region’s hydrogeologic system.
- Help the WPC Partners better understand the relationship between surface water in local rivers and the level of groundwater in underground aquifers.
- Provide an early warning system to local groundwater users in case of contamination.

The grant, along with local cost-sharing monies contributed by the WPC Partners, was designated for installation of three sets of double- or triple-completion groundwater monitoring wells in the WPC area. Through careful management of the grant funds the funding was stretched to allow installation of a fourth set of groundwater monitoring wells.

In addition to the grant funds, local agencies have also funded projects to enhance the understanding of the groundwater resource. The City of Roseville installed three sets of triple-completion groundwater monitoring wells west of the city boundary.

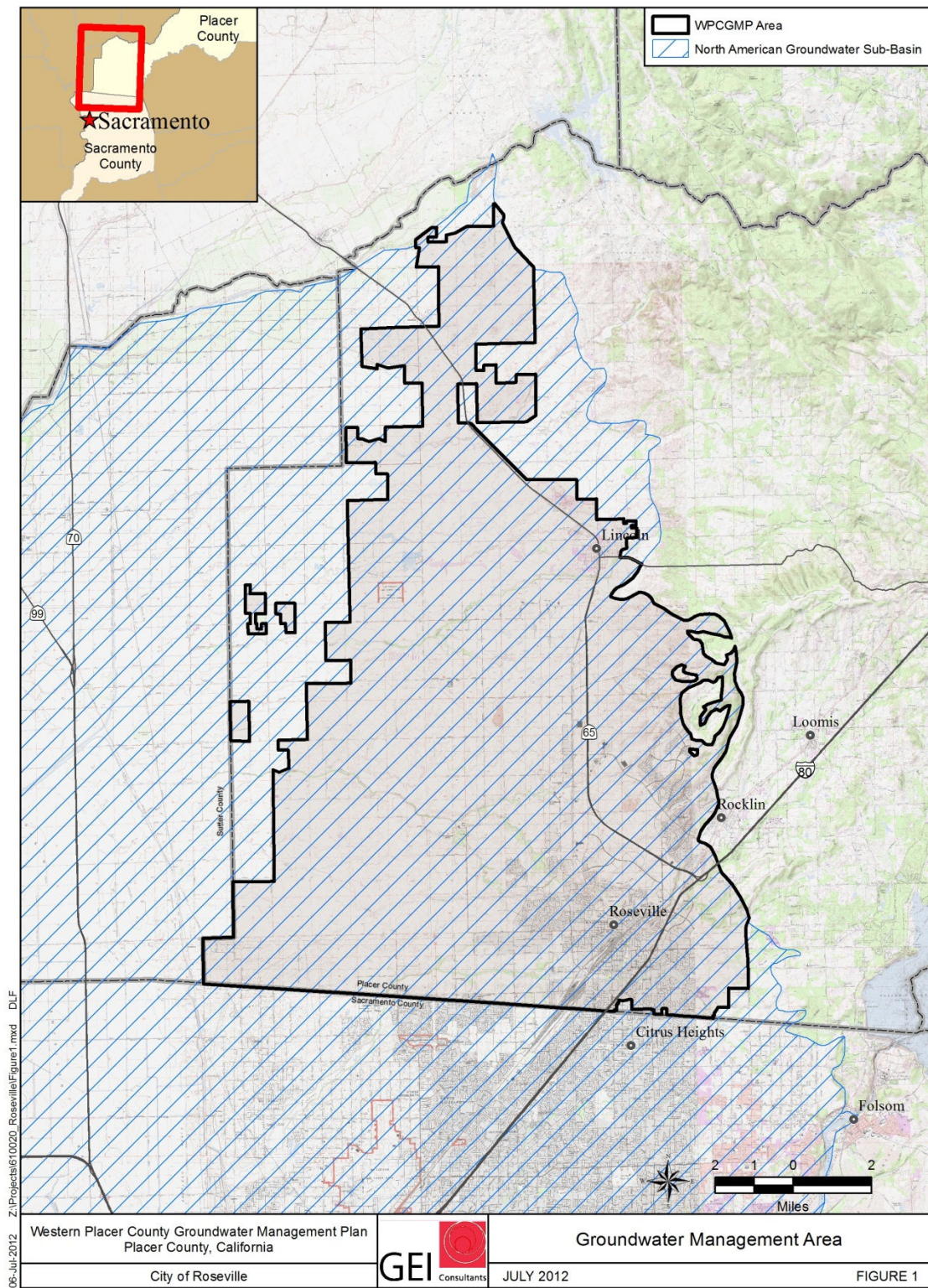


Figure 1 - Groundwater Management Area

In total, the WPC Partners have established new groundwater monitoring points at 18 discrete depth intervals at seven geographic locations in WPC. **Figure 2** shows the monitoring well locations. Information gathered from the construction of these new wells provides valuable hydrogeologic knowledge in the area, including:

- Confirmation of and the depths associated with the four different geologic formations in the area: the Riverbank, Tulare/Laguna, Mehrten, and Ione Formations.
- Groundwater quality in the Ione Formation varies between clean, potable water and brackish water that is unsuitable for municipal or agricultural use. The fresh water portions of the Ione Formation represent a previously unidentified aquifer that must be managed. **Figure 2** shows the approximate extent of this fresh water body. The presence of good quality water in the Ione Formation suggests the Loomis Basin is a recharge area because there must be flow through the aquifers otherwise brackish water would be present. Therefore, the Ione Formation may be connected to and recharging the Mehrten aquifers. **Figure 3** shows this relationship and also shows some of the municipal production well screen intervals (i.e., the production aquifers).
- Mixing or upwelling of brackish groundwater from the Ione Formation may degrade water quality in the Mehrten Formation, the primary drinking water aquifers.
- Groundwater levels are about 100 feet below ground surface, indicating there is a potential to store about 100,000 acre-feet of water.
- Groundwater levels in the Mehrten and Laguna aquifers in the eastern portion of WPC have similar elevations; however, to the west there is up to 7 feet of groundwater level differences suggesting the aquifers are more confined and that there could be a significant depletion of water in deeper aquifers that may not be detected by monitoring just groundwater levels in the shallow aquifers.
- Groundwater levels in the upper and lower Mehrten Formation have similar water levels.

These new monitoring wells were also incorporated into the California Department of Water Resources' (DWR) California State Groundwater Elevation Monitoring (CASGEM) program to evaluate seasonal and long-term changes in groundwater elevations across the state. The City of Roseville has taken the lead and is designated as the monitoring entity. The WPC Partners have conducted biannual groundwater level monitoring and reporting since October 2011. Groundwater levels were last measured in May 2012.

Additional Groundwater Management Activities

Placer County Water Agency (PCWA) in June 2012 also constructed test wells to continue to develop an understanding of the water resource potential. A test well drilled to the base of the Mehrten Formation found potable water at about 300 feet below ground surface near Highway 65 and Sunset Boulevard, suggesting the adjacent and underlying Ione Formation may contain potable water. **Figure 2** in conjunction with information obtained from the 2008 grant funded monitoring wells and existing water supply wells show the approximate extent of fresh water within the Ione Formation. The fresh water shows the extent of where recharge is reaching the aquifers.

The City of Roseville has funded development of a ModFlow groundwater flow model in 2010 to 2012 to assess operations and water quality for the ASR well program. The model simulates groundwater recharge through soil permeability values obtained from USDA Soil Survey Inventories. **Figure 4** shows the areas where recharge was projected to occur in 2004, an average water year. The map shows that very little recharge is projected to occur in the area where potable water has been found in the Lone Formation, indicating recharge is taking place somewhere in the area and that these fresh water aquifers are connected to the Mehrten aquifers. Further refinement of the recharge areas is needed.

The model also is suggesting there is considerable recharge along the lower reaches of Dry Creek as shown on **Figure 4**. Although soil permeability values may be indicating a high potential for recharge, the permeability is likely only valid from ground surface to 6 to 8 feet below ground surface, to the soil profile. Permeable sediments beneath these depths must be present to convey the water into the aquifers. Currently, the type of sediments and whether the recharge can percolate to the aquifers within WPC is speculative. The model currently simulates groundwater recharge from creeks as continuous recharge throughout the year. However, studies from other areas in the western U.S. suggest that recharge likely occurs after the first heavy rain event that scours the bottom of the channels and removes fine sediments that have accumulated during the summer months. The recharge then diminishes after the rainy season as lower flows allow accumulations of fines that plug the pores. This seasonal recharge is not being replicated in the model, and as such the model could be over-predicting the amount of recharge from creeks and rivers.

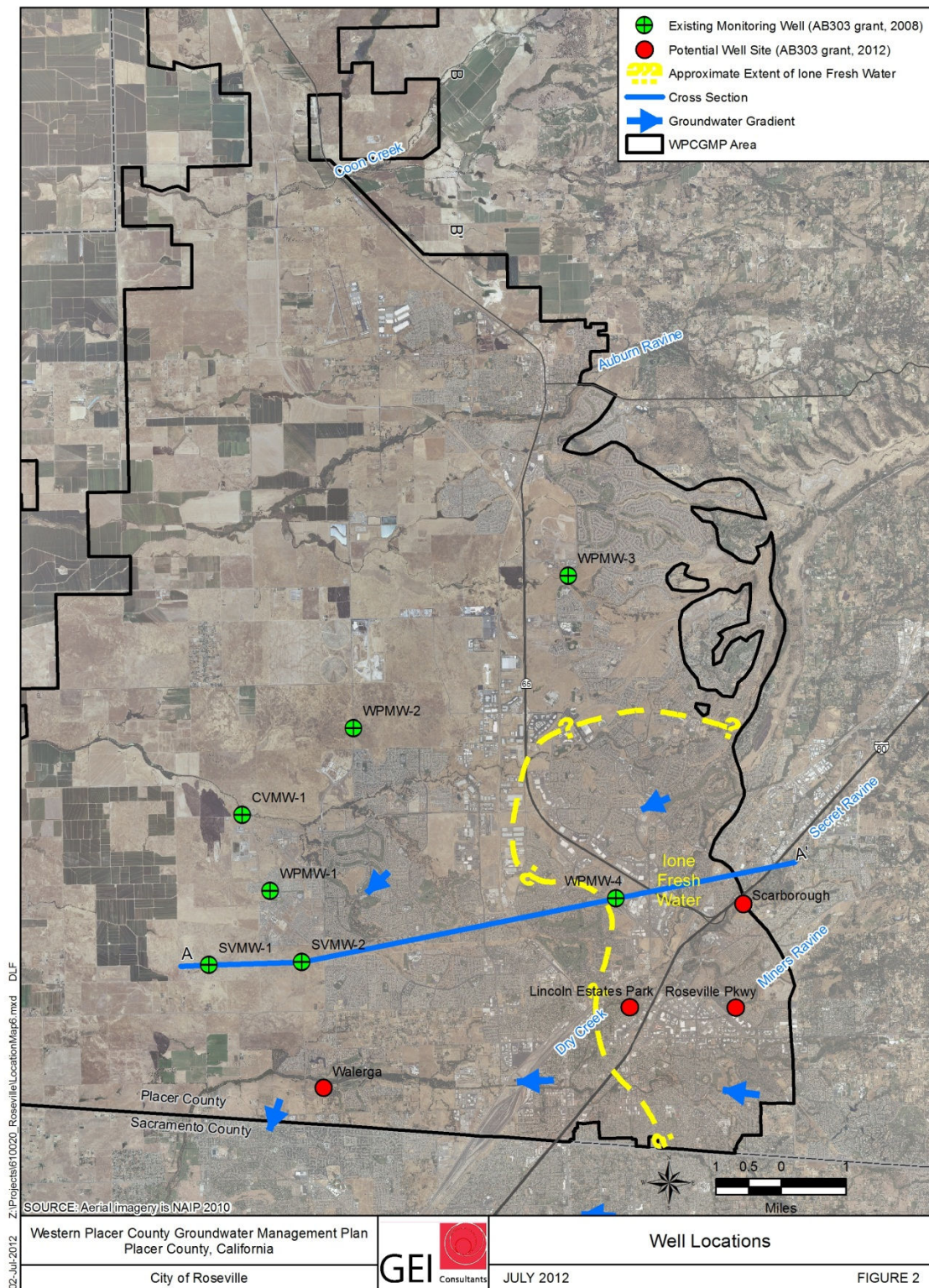
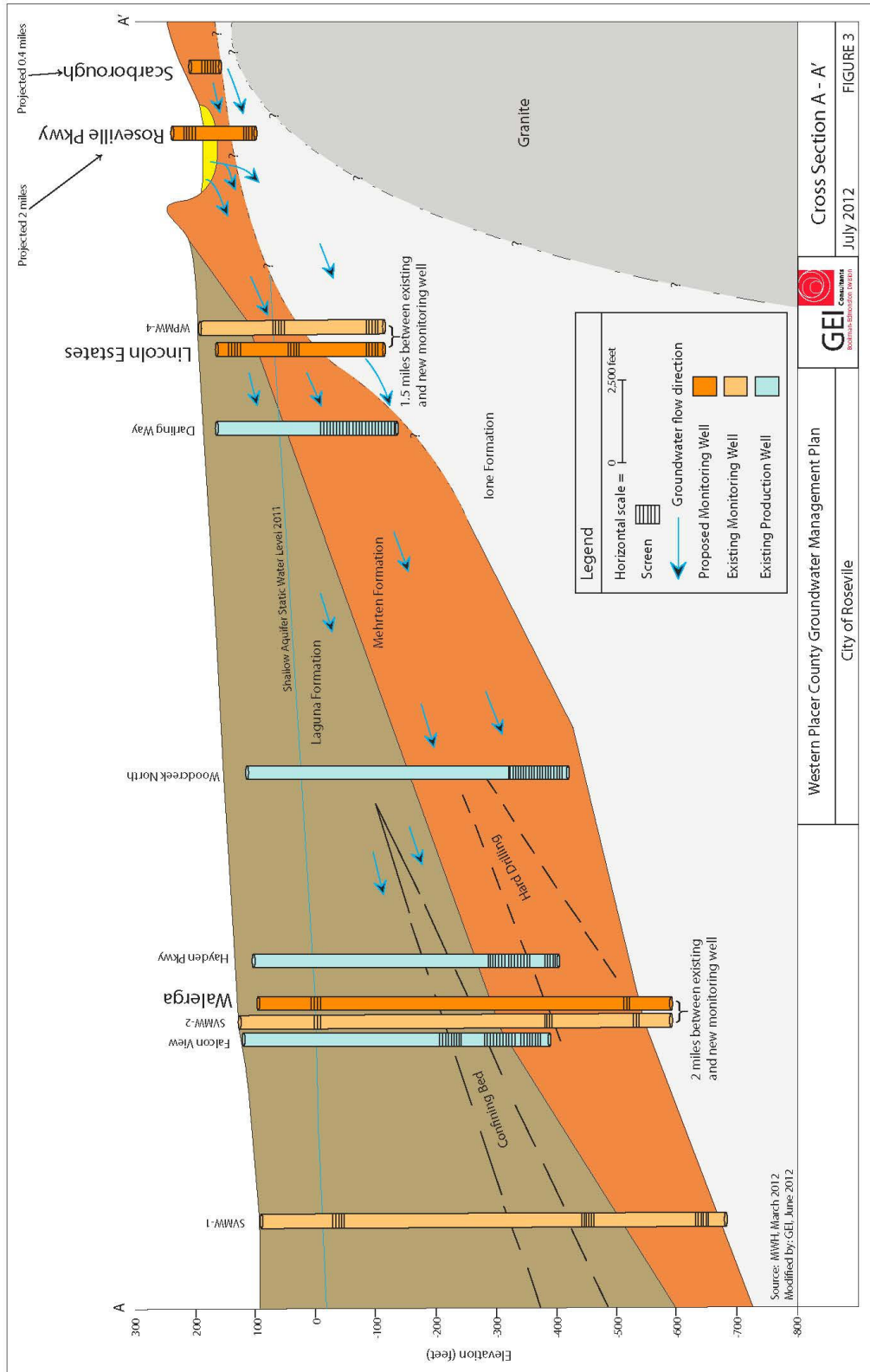


Figure 2 – Potential Monitoring Well Locations



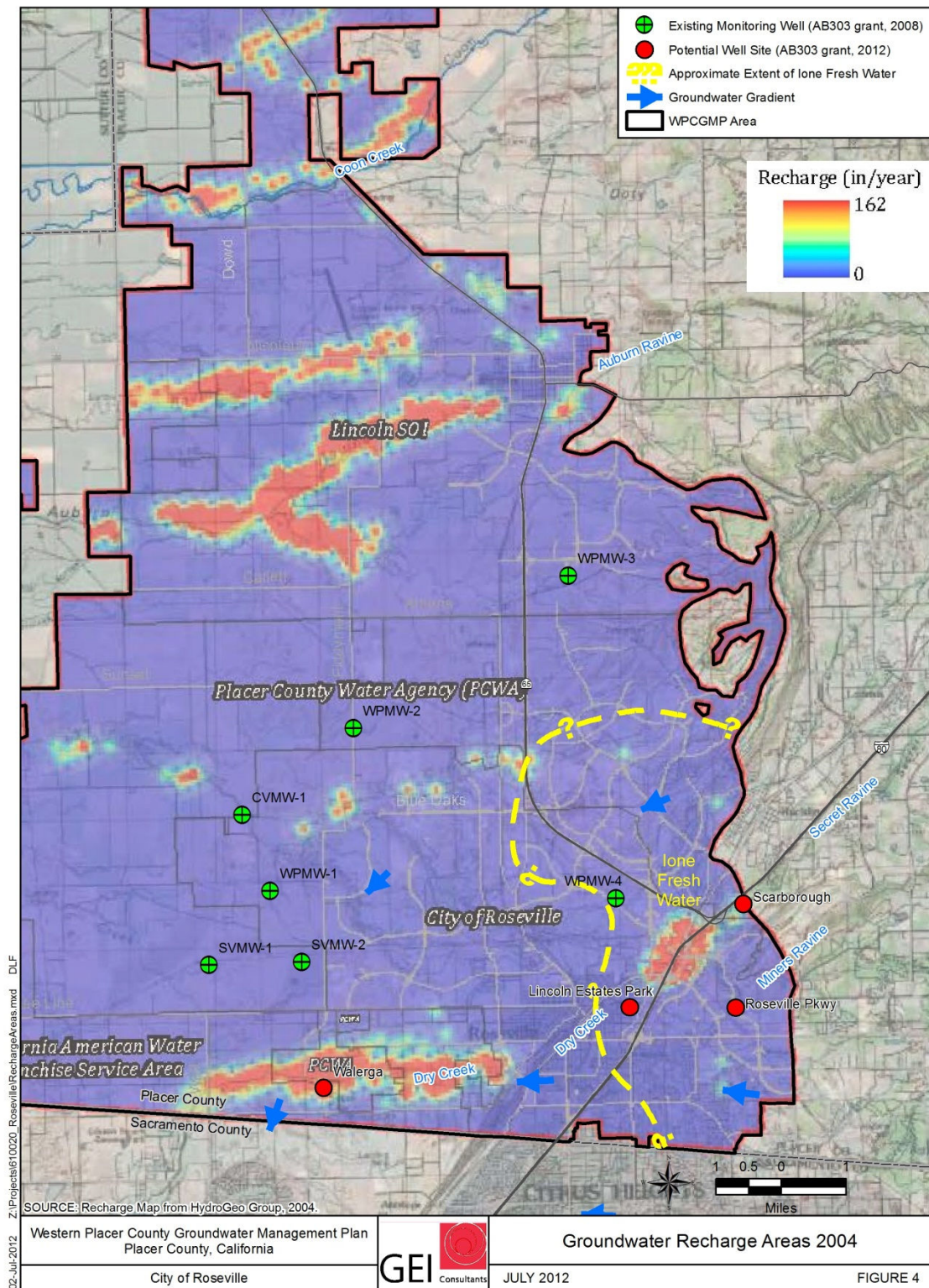


Figure 4 – Groundwater Recharge Model Using Soil Permeability

Goals

The goal of the WPCGWMP is to “maintain the quality and ensure the long-term availability of groundwater to meet backup, emergency, and peak demands without adversely affecting other groundwater uses within the WPCGWMP area.” The proposed project supports this goal and the criteria of the Local Groundwater Assistance Grant by:

- **Recharge Opportunities:** Defining groundwater recharge areas along three major creeks (Secret Ravine, Miners Ravine, and Dry Creek) and providing data to quantify the recharge amount, when it occurs, and which aquifers receive the recharge.
- **Groundwater Model Calibration:** Providing the depth of the sediments to quantify subsurface inflow to WPC from the Loomis Basin.
- **Groundwater Management:** Improving our understanding of the aquifer relationships toward the west, in the outflow area from WPC to Sacramento County, where groundwater level differences suggest deeper Mehrten aquifers are being depleted, but shallow aquifers are not affected.
- **Groundwater Quality:** Providing understanding of the water quality impacts of the Ione Formation on fresh water aquifers and allow development of management practices to prevent brackish water intrusion.
- **Groundwater Quality:** Further defining the extent of previously unidentified fresh water aquifers in the Ione Formation near the southeastern portion of WPC.
- **Groundwater Monitoring:** Supplementing the WPC and CASGEM monitoring networks.

Portions of the funding would also be used to supply information to update the WPCGWMP on completion of this grant work, as required by AB 359, to map and define groundwater recharge areas, as part of an SB1938 compliant groundwater management plan. Update of the WPCGWMP is not part of this project

Needed Facilities

To meet these goals, additional monitoring wells are needed in the area to supplement and expand the knowledge developed by the WPCGWMP and previously constructed monitoring wells. The proposed project funded by this AB303 grant would construct single- to triple-multi-level groundwater monitoring wells with 10 discrete depth intervals at 4 different locations shown on **Figure 2**. The Project focuses on the southern portion of the groundwater basin where the potential for groundwater use is the highest and more boundary information is required.

Table 1 lists the names of the well sites and shows the proposed construction details of the monitoring wells. **Figure 3** shows the monitoring depths and formations.

- **Walerga Water Storage Tank Site** - One set of dual-completion monitoring wells will be constructed to provide further definition of the aquifers in the area, provide groundwater level conditions for an outflow area along the southern side of WPC and Sacramento County, and provide head conditions in Laguna/Turlock and Mehrten aquifers to assess the gradients between the aquifers and whether some aquifers are full while deeper aquifers

are being depleted, and provide an early warning detection of whether water in the Lone is upwelling and affecting groundwater quality in the Mehrten Formation aquifers used for municipal water supply (brackish water intrusion). The monitoring wells will provide a dedicated monitoring well in an area not currently being monitored. It will replace two inactive wells previously monitored by DWR and monitoring at two PCWA groundwater supply wells to provide accurate definition of groundwater levels within each aquifer.

- Scarborough Park Site – One monitoring well will be constructed at this location to provide new groundwater monitoring capability in an area previously not monitored, define the subsurface profile for inflow to the WPC, define whether Secret Ravine is a groundwater recharge area, provide data to quantify the amount of recharge contribution from the creek, assess whether this area provides recharge to the fresh water Lone Formation aquifers, maintain surface water in Secret Ravine to protect Salmon Habitat, and provide new information to help calibrate the existing groundwater model.
- Roseville Parkway Park – Two sets of monitoring wells (one single-completion and one double-completion) constructed at this location will provide new groundwater monitoring capability in an area previously not monitored, help define whether Miners Ravine is a groundwater recharge area, provide data to quantify the amount of recharge contribution from the creek, and provide the shape of the groundwater mound to help calibrate the existing groundwater model.
- Lincoln Estates Park - Two sets of monitoring wells (one single-completion and one triple-completion) constructed at this location will provide new groundwater monitoring capability in an area previously monitored by two production water supply wells, to help assess groundwater/surface water interactions along Dry Creek, help define a potential groundwater recharge area, help quantify the amount of groundwater recharge contribution from the creek, assess the extent of fresh water Lone Formations aquifers, and provide new information by defining the shape of the groundwater mound to help calibrate the existing groundwater model.

Table 1
Monitoring Well Construction Summary

Well Site Name	Monitoring Well Name	Well Screen Depth	Formation Monitored	Purpose
Walerga	WPCMW-5A	80-100	Laguna/Turlock	Whether Shallow Aquifer is Affected by Municipal Pumping
	WPCMW-5B	630-650	Lower Mehrten	Brackish Water Intrusion
Scarborough	WPCMW-6A	25-65	Alluvium	Secret Ravine GW Recharge
Roseville Parkway	WPCMW-7A	20-40	Alluvium	Miners Ravine GW Recharge
	WPCMW-8A	20-40	Alluvium	Miners Ravine GW Recharge
	WPCMW-8B	120-140	Lower Mehrten	Miners Ravine GW Recharge
Lincoln Estates	WPCMW-9A	20-40	Alluvium	Dry Creek GW Recharge
	WPCMW-10A	20-40	Alluvium	Dry Creek GW Recharge
	WPCMW-10B	120-140	Upper Mehrten	Dry Creek GW Recharge
	WPCMW-10C	240-260	lone	Brackish Water Intrusion

Locations

Figure 2 shows the proposed monitoring well locations. The WPC Partners have established a solid monitoring well network in the middle of the basin. The wells for the proposed project will focus on the eastern and southern boundary conditions, where more information is needed. All proposed properties are owned by the WPC Partners, except for the Scarborough Site, which has a signed agreement for a permanent easement. The agreement is included in Attachment 4.1.

Area Affected

The construction of the monitoring wells will supply new information to help manage groundwater levels and water quality in WPC. Since groundwater from the WPCGWMP management area outflows to aquifers beneath Sacramento County and Sutter County, these areas will also receive benefit. WPC is a recharge area to both of these counties.

Collaboration

The WPCGWMP was developed in a joint effort by the City of Roseville (Roseville), the City of Lincoln (Lincoln), Placer County Water Agency (PCWA), and the California American Water Company (Cal Am), together referred to as the WPC Partners. The WPC Partners are not the only users of the Subbasin, but their political boundaries cover the majority of the area where Western Placer County overlies the entire Subbasin, as shown on **Figure 1**. The WPC Partners have adopted the WPCGWMP and since 2010 have begun its implementation. The WPC Partners hold quarterly public meetings to organize and disseminate information. The WPC Partners have unanimously authorized preparation of this grant application and provided properties for construction of monitoring wells.

Project Need and Merit

Among the issues that WPC is facing are lowering groundwater levels in the southwest portion of the basin, increasing TDS levels, and increasing demand in the area. These issues need to be addressed to conserve this valuable resource. This project strives to offer solutions to these problems by providing critical new information about the subsurface conditions that will aid in future management decisions. The results of this project will impact future management of the basin including conjunctive use, water conservation, groundwater level monitoring, water quality management, and much more.

New Knowledge

This project will provide knowledge about groundwater in WPC. Specifically it will help our understanding of:

- Whether portions of Secret Ravine, Dry Creek, and Miners Ravine are recharge areas and how groundwater pumping in the valley affects these surface water sources
- The extent of brackish water and whether it is moving as a result of groundwater pumping
- The subsurface inflow and outflow profiles to better quantify volume estimates

The project will also provide additional data collection points for CASGEM.

Improvement in Groundwater Management

The findings from the previous investigations will be further refined by this grant funding and could be used to develop groundwater management actions including:

- Identify the Miner's Ravine groundwater recharge potential to consider whether to improve about ten acres of existing stormwater detention basins and existing depressions adjacent to Miner's Ravine (all owned by the City of Roseville), and potentially new spreading basins to recharge the production aquifers. The City of Roseville already has a nearby pipeline that if extended could be capable of feeding the existing detention basins. If it can be shown that

this is a significant recharge area, the potential for artificial recharge using existing facilities is on the order of 4,000 to 11,000 acre-feet per year depending on recharge rates.

- Identifying the recharge potential associated with PCWA's ability to use canal system water to provide to Miners Ravine and Secret Ravine, wetting additional portions of Dry Creek during dry months of the year. The recharge potential is conservatively on the order of 5,000 acre-feet per year.
- Protect salmon habitat in Secret Ravine from lowering of groundwater levels by pumping within the Sacramento Groundwater Association (SGA) or WPCGWMP areas. Identify whether Secret Ravine is a major source of recharge to the area and whether to consider development of spreading basins/stormwater detention basins in the area.
- Identify whether Dry Creek, near the Walerga Tank site, in the western portion of the GMP area is indeed a groundwater recharge area and which aquifer(s) the recycled water may be recharging.
- Develop a conjunctive use program to allow greater use of groundwater (currently 20,000 acre-feet per year) and potentially make more surface water (currently 180,000 acre-feet per year) available for environmental or other water users.
- Balance pumping to prevent upwelling of brackish water from the Ione Formation from affecting the fresh water Mehrten aquifer.
- Provide a revised base of fresh water maps for the County inspectors to use when allowing new well permits (maximum drilling depths or allow them to establish special study requirements) and to identify existing wells that may be allowing brackish water upwelling to focus a well destruction program.

The project will improve groundwater management and understanding of the groundwater basin. The project will benefit municipal, industrial, and agricultural groundwater users within Placer County by providing depth-discrete groundwater levels which will allow the WPC Partners to develop more specific (refined) groundwater management actions. It may also benefit the environment by providing more in-depth knowledge of surface water/groundwater interactions. This project will also assist in mapping of groundwater recharge areas for the WPCGWMP to comply with AB359 requirements.

Ongoing Use

The WPC Partners have committed to ongoing monitoring of the wells within each of their respective jurisdictions through the CASGEM agreement. The WPC Partners have approved funding through 2013 and are in the process of formulating a scope of actions and costs through 2014. They plan to continue to fund groundwater management activities beyond 2014.

The City of Roseville is a designated monitoring entity and committed to ongoing participation in the CASGEM program.

Attachment 4.1

Easement Agreements

City of Rocklin



3970 Rocklin Road
Rocklin, California 95677-2720

O | 916.625.5000
F | 916.625.5095
TTY | 916.632.4013
www.rocklin.ca.us

July 10, 2012

Mr. Tony Firenzi
Senior Engineer
Placer County Water Agency
P.O. Box 6570
Auburn, CA 95604

Subject: Letter of Support – Monitoring Well site, City of Rocklin: "Groundwater Recharge & Outflow Mapping Program"

Dear Mr. Firenzi,

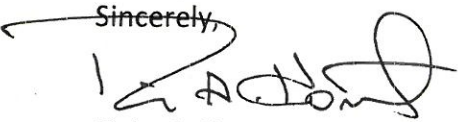
The City of Rocklin supports the Western Placer County Groundwater Management Plan AB 303 Grant Application for Recharge Area Mapping and Monitoring ("Groundwater Recharge & Outflow Mapping Program") proposed by the Western Placer County Groundwater Management Plan (WPCGMP) partners.

As required by SB1938 and specifically identified in the WPCGMP, the City understands the need to construct dedicated monitoring wells in the basin. These wells will serve many purposes in the basin including identifying groundwater recharge areas, collecting information where groundwater elevation and quality data are sparse, providing information on the relationship between surface water flow in local rivers and streams to groundwater elevations (evaluation of recharge), acting as an early warning system for constituents of concern in groundwater, and providing much needed lithologic and geophysical data to characterize the hydrogeologic system on a regional scale.

If awarded an AB303 grant, the City plans to cooperate with the Placer County Water Agency and the WPCGMP partners to convey a permanent easement for a monitoring well on parcel number 454-060-031-000. The monitoring well will be constructed, owned, operated, and maintained by the Placer County Water Agency.

Please do not hesitate to contact me at 916.625-5560 should you have any questions.

Sincerely,


Ricky A. Horst
City Manager